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ABSTRACT

The question of whether performance measures may be more accurate than examination methods to assess an individual's abilities and knowledge is examined, based on a literature review. An information processing view that focuses on the internal activities of thinking and the relationship to external stimuli is considered. Information processing studies indicate that: (1) a person applies one's own rules and strategies in problem-solving, and (2) a comprehensive test is a general test that does not consider the fact that some individuals may require more information or time to sufficiently answer the question. Attention is directed to "executive control processes," or mechanisms that vary among individuals and that determine the learner's information processing approaches for different learning tasks. The functioning of the executive control process in a problem-solving activity is related to progressive deepening and reaction time. Progressive deepening is a process that humans go through as problem-solvers in a hypothetical action. It is proposed that the evaluation of individuals exposed to performance-oriented instruction should include attributes of the performance orientation, flexible time constraints, and freedom to use one's own strategies. (SW)

THE CASE AGAINST THE COMPREHENSIVE EXAM

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INTRODUCTION

The study of learning goes back at least 100 years. (Kulik and Kulik, 1979). Ebbinghouse, Thorndike, Pavlow, and Watson, among others, pioneered methods for examining the relationship of thinking to learning. Early studies indicated that learning was predominately an external activity; that is, a given stimulus was said to produce a given response with little consideration given to the organism through which this process must pass. No matter the background, influences or composition of the organism, stimuli were said to produce expected responses. Unexpected responses were attributed to deficiencies in the organism itself.

More recently, educational research and theory has focused on the internal activities of thinking and the relationship to external stimuli. From this focus, educators have learned about the unanticipated responses to stimuli and, more importantly, the significance of individual differences. Researchers now believe that an unanticipated response to a particular stimulus may be attributed to the way an organism perceives the stimulus rather than with any deficiency in the organism itself.

Directly translated into educational practice, this focus on human understanding and thinking, known as "information processing" challenges the accuracy of standardized evaluation in certain instances. Does an examination, for example, measure an individuals' true knowledge and abilities or are there other important factors to be considered? Is it possible that inadequate responses to examination questions may be attributable to lack of response time, or varying perceptions of what the question is asking. Given the differences in individuals cited by the recent studies in information processing, would performance methods of evaluation be more accurate for some individuals

than comprehensive examinations?

The section that follows, is a review of the literature as it relates to the above questions, and is an attempt to show that, in fact, performance measures may be more accurate than examination methods when assessing an individuals abilities and knowledge.

PERFORMANCE MEASURES VS. THE COMPREHENSIVE EXAM

Concerns by educators as to the accuracy of the comprehensive examination as a measure of a student's knowledge and ability are not new. In 1933, Jones examined the comprehensive examination in American colleges. In his chapter titled "Improving the Examination", Jones cites an even earlier 1918 English analysis of the written comprehension examination process and its relationship to culture. According to Jones, Hartog, the educator, deplored the "tremendous number of failures in the great mass of examinations in the United Kingdom--about 50 percent. This is partly because written examining is so mechanical. It is geared for the masses and cannot fit the individual". (Jones, 1933, p. 221).

Jones added that many superior college students indicated they would not want to stake everything on such an examination. Discontentment with this process has continued through the decades, but research has offered little support for these misgivings about the adequacy of the comprehensive exam, until the development of the information processing models of educational theory.

Recent developments in human information retrieval and comprehension have led psychologists Lindsay and Norman (1972) to conclude that "the development of individual differences and idiosyncratic systems should be the rule, rather than the exception. Understanding evolves through a combination of external evidence and the internal operations that manipulate and reorganize the incoming information". (p. 432)

Why does this recent information about how an individual thinks pose serious questions about the comprehensive exam as a valid measure for everyone?

To understand the need for performance measures rather than descriptive measures in particular instances, one must examine the "vigorous study of cognition and individual differences within an information-processing framework" (Doyle, 1979, p. 183). "The current focus, in other words, is not simply on the supportive atmosphere of the classroom; it is also on the activities that occupy students' time during instruction". (Doyle, 1979, p. 185)

Performance can be an important part of learning as well as an important tool for the assessment of an individual's ability to apply this knowledge in a problem solving situation.

"Knowing the recipe for preparing food does not, as many novice knows, assure the success of the finished product. Extensive knowledge of vocabulary and rules of grammar do not, in themselves, assure a student of the ability to express himself and his ideas in literary endeavors. It is for these reasons that performance tests are sometimes important devices for assessing educational achievements". (Ryan and Frederiksen, 1951, pp. 455-456)

Information processing studies according to Gagne (1977) have attempted to construct a framework for explaining human understanding. The relationship of performance to theories of information processing is important to the field of curriculum and instruction because C & I is responsible for translating these theories into practice.

Today's living calls for problem-solving skills, concept formation, data-processing skills, the ability to make judgements and discriminate, the ability to relate causes to effects, the ability to analyze, the ability to summarize and the ability to form valid conclusions. In summary, present day education places too much emphasis on the learner's memorization

of information. Problem solving skills are neglected. (Burns and Brooks, 1974, p. 42-43)

From Information Processing Studies, five important findings have surfaced which underscore the need for including performance measures when planning curriculum and instruction.

1) Although there is a lack of agreed upon tools for analyzing individual exploratory behaviors, protocal suggests that a person gradually accumulates new information about a problem by applying his or her own rules and strategies. (Lindsay and Norman, 1972) These individual rules and strategies may be foreshadowed by the rules and strategies permitted by the comprehensive examination. A conflict occurs then between the rules of the exam and rules and strategies of the individual student. A performance measure may neutralize these differences in rules.

2) The method by which the student learns and the method by which student is examined should also be similar. If performance methods are used as the principle tools for learning they they should also be used as the methods of evaluation.

3) Even though many comprehensive examinations attempt to measure problem-solving skills and abilities as well as knowledge, examinations cannot, in all cases function adequately because of the differences in individual learning mechanisms. These mechanisms that vary from individual to individual are often labeled "executive control processes". "The function of the executive control process is to determine the particular kinds of information processing in which the learner engages to accomplish particular kinds of learning tasks. They determine the learner's approach to one or more ways of processing information". (Gagne, 1977, p. 59)

Executive control strategies vary from individual to individual and from task to task. There are two variables, however, that are related directly to the functioning of the 'executive control process' in a problem solving activity. One is the method of "progressive deepening". The other is "reaction time".

A) PROGRESSIVE DEEPENING

Progressive deepening, according to Newell and Simon, is a process that humans go through as problem solvers in a hypothetical action. (Eisenstadt and Kareev, 1975) "Progressive deepening is a strategy based on a decision tree. Specifically, they (learners) pursue a branch until a decision can be tested. Once it has been tested and found lacking, the problem solver returns to the base and pursues another branch". (Davis, Alexander and Yelon, 1974, p. 267).

In order to accomplish "progressive deepening" the performance oriented individual must have at his or her disposal tools for investigation and analysis. The ability to conduct research, to examine public reaction, and to determine the feasibility within the current system are but a few of the important aspects of the progressive deepening process in a performance orientation. In other words, the performance process of "progressive deepening" relies heavily on feedback. Feedback that is not available in the comprehensive examination process. "Sensitivity to feedback is a major determinant of a person's potential to improve his or her work." (Sternberg, 1981, p. 19) This is vital in a performance orientation.

The "orientation toward intellectual skills, toward what the student is able to perform, rather than what he knows, is an extremely important result of developing educational technology. It has been the systematic development of procedures and techniques of instruction, based on psychological theory".

(Gagne, 1974, pp. 58-59)

B) REACTION TIME

The tools for evaluating learning competencies in curriculum and instruction design using the process-performance oriented method should be process-performance in nature rather than in the form of a comprehensive time limiting examination. Enter then the second important variable in the executive control process in problem solving activities, time. Panchella (1974) says that 'reaction time' is an important aspect of speed-accuracy realtionships. This 'reaction time' is credited with producing two types of responses; stimulus controlled response and fast-guess response. (Panchella, 1974, p.70)

Stimulus controlled responses allow the subject to take as much time as necessary for an accurate response. This is indicative of the performance process which allows the subject to control his or her response time, and thereby control the response.

Fast guess responses occur in situation which require cognitive adjustments to speed stress. For some the comprehensive exam is indicative of this. These cognitive adjustments may involve the alteration of the critical values of the stimulus evidence which must be accumulated. In other words, the quantity and quality of input may be reduced, because the evaluation of such input has been removed from the subjects control. This, in turn, will lead to low critical values, which will lead to fast reaction times and thereby produce high error rates. (Panchella, 1974)

CONCLUSION

After fifteen years of study, Simon and Newell, whose information processing models inspired the psychological studies of Lindsay, Norman, and Rummalharts; influenced the writing of Gagne, and led to the curriculum development models of Eisner and others; concluded: "A few, and only a few of the gross

characteristics of the human information-processing systems are invarient over task and problem". (Hunt and Poltrock, 1974, p. 344)

Tasks and problems are as varied as the skills implemented to achieve a solution. "Ability tests seem to provide only the most limited measurement of.....a.....skill". (Sternberg, 1981, p. 19) This may be due in part to the fact that a comprehensive test is a general test. It does not consider the fact that some individuals may require more information or more time to sufficiently answer the question. Again, this is not due to inability but strictly to an individual's process methods.

What seems to me to be important lessons to have come from programmed instruction is, very simply, that instruction must be designed to teach the student the capability of doing something not knowing something. The notion of the performance objective is important because it emphasizes the doing. To use other terms familiar to curriculum designers, the primary purpose of instruction is process not content. (Gagne, 1974, p. 58)

But programmed or performance oriented instruction's greatest strength is that it can accomodate individual executive control strategies. That is, programmed instruction is flexible with regard to completion time and thereby flexible enough to allow an individual to implement his or her own methods of 'progressive deepending'.

It seems appropriate then that performance oriented methods should be used in evaluating the abilities of a person that has chosen a performance route in instruction. These evaluation methods should in turn include that attributes of the performance orientation; flexible time constraints and freedom to use ones own strategies.

According to Scriven, finding the value or quality of an educational product is a complex matter based upon various kinds of information. Of his thirteen suggestions for assessing the value of educational programs or product

however, nine are concerned primarily with some sort of performance. (Gagne and Briggs, 1979, pp. 287-88)

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